

CLAIMS:

1. An electrophoretic display device (1) comprising an electrophoretic material comprising charged particles (8, 9) in a fluid (10), a plurality of picture elements, first and second electrodes (5, 6) associated with each picture element, the charged particles (8, 9) being able to occupy a position being one of a plurality of positions between said electrodes (5, 6), said positions corresponding to respective optical states of said display device (1), and drive means arranged to supply a drive waveform to said electrodes (5, 6), said drive waveform comprising: a) a sequence of drive signals, each effecting an image transition by causing said particles (8, 9) to occupy a predetermined optical state corresponding to image information to be displayed, and b) at least one voltage pulse in respect of each drive signal for inducing a substantially uniform electric field distribution across said display device (1).
2. A display device (1) according to claim 1, wherein said at least one voltage pulse for inducing a substantially uniform electric field distribution across said display device (1) is provided in said drive waveform prior to each drive signal.
3. A display device (1) according to claim 2, wherein said at least one voltage pulse for inducing a substantially uniform electric field distribution across said display device (1) is provided in said drive waveform immediately prior to each drive signal.
4. A display device (1) according to any one of the preceding claims, wherein said at least one voltage pulse comprises a single voltage pulse of a fixed polarity in respect of each drive signal.
5. A display device (1) according to any one of claims 1 to 3, wherein multiple voltage pulses of a fixed polarity are provided in respect of each drive signal for inducing a substantially uniform electric field distribution across said display (1).

6. A display device (1) according to any one of the preceding claims, wherein said at least one voltage pulse is applied to all of said picture elements, or at least a significant proportion thereof, simultaneously.
- 5 7. A display device (1) according to any one of claims 1 to 3 or 6, multiple voltage pulses of alternating polarity are provided in respect of each drive signal for inducing a substantially uniform electric field distribution across said display (1).
8. A display device (1) according to claim 7, wherein said multiple voltage
10 pulses are of substantially regularly alternating polarity.
9. A display device (1) according to claim 7, wherein said multiple voltage pulses are of irregularly alternating polarity.
- 15 10. A display device (1) according to any one of the preceding claims, wherein said drive waveform is pulse width modulated.
11. A display device (1) according to any one of claims 1 to 9, wherein said drive waveform is voltage modulated.
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12. A display device (1) according to any one of the preceding claims, wherein at least one individual drive waveform is substantially dc-balanced.
13. A display device according to any one of the preceding claims, wherein at
25 least some of the sub-sets of closed loops wherein an image transition cycle causes a pixel to have substantially the same optical state at the end of said cycle as at the beginning, are substantially dc-balanced.
14. A display device (1) according to any one of the preceding claims, comprising
30 two substrates (2), at least one of which is substantially transparent, whereby the charged particles (8, 9) are present between the two substrates (2).
15. A display device (1) according to any one of the preceding claims, wherein the charged particles (8, 9) and the fluid (10) are encapsulated.

16. A display device (1) according to claim 15, wherein the charged particles (8, 9) and the fluid (10) are encapsulated in a plurality of individual microcapsules (7), each defining a respective picture element.

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17. A display device (1) according to any one of the preceding claims, having at least three optical states.

18. A display device (1) according to any one of claims 1 to 17, wherein image
10 transitions are effected in respect of one or more picture elements which do not substantially require an optical state change.

19. A display device (1) according to claim 18, wherein image transitions are
15 effected in respect of all picture elements which do not substantially require an optical state change.

20. A method of driving an electrophoretic display device (1) comprising an
electrophoretic material comprising charged particles (8, 9) in a fluid (10), a plurality of
picture elements, first and second electrodes (5, 6) associated with each picture element, the
20 charged particles (8, 9) being able to occupy a position being one of a plurality of positions
between said electrodes (5, 6), said positions corresponding to respective optical states of
said display device(1), the method comprising supplying a drive waveform to said electrodes
(5, 6), said drive waveform comprising: a) a sequence of drive signals, each effecting an
image transition by causing said particles (8, 9) to occupy a predetermined optical state
25 corresponding to image information to be displayed, and b) at least one voltage pulse in
respect of each drive signal for inducing a substantially uniform electric field distribution
across said display device (1).

21. Apparatus for driving an electrophoretic display device (1) comprising an
30 electrophoretic material comprising charged particles (8, 9) in a fluid (10), a plurality of
picture elements, first and second electrodes (5, 6) associated with each picture element, the
charged particles (8, 9) being able to occupy a position being one of a plurality of positions
between said electrodes (5, 6), said positions corresponding to respective optical states of
said display device (1), the apparatus comprising drive means arranged to supply a drive

waveform to said electrodes (5, 6), said drive waveform comprising: a) a sequence of drive signals, each effecting an image transition by causing said particles (8, 9) to occupy a predetermined optical state corresponding to image information to be displayed, and b) at least one voltage pulse in respect of each drive signal for inducing a substantially uniform electric field distribution across said display (1).

22. A drive waveform for driving an electrophoretic display device (1) comprising an electrophoretic material comprising charged particles (8, 9) in a fluid (10), a plurality of picture elements, first and second electrodes (5, 6) associated with each picture element, the charged particles (8, 9) being able to occupy a position being one of a plurality of positions between said electrodes (5, 6), said positions corresponding to respective optical states of said display device (1), the apparatus comprising drive means arranged to supply said drive signal to said electrodes (5, 6), said drive waveform comprising: a) a sequence of drive signals, each effecting an image transition by causing said particles (8, 9) to occupy a predetermined optical state corresponding to image information to be displayed, and b) at least one voltage pulse in respect of each drive signal for inducing a substantially uniform electric field distribution across said display device (1).